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ABSTRACT

This report describes research into the effectiveness of the language laboratory in improving students' reading, listening and speaking skills in secondary school language programs. The experiment, involving some 5,000 students in 21 school districts of the Metropolitan School Study Council, was restricted to students of French. Student achievement of the laboratory and the non-laboratory groups was based on various examinations: (1) a speech production test, devised for the experiment and administered to a 10 percent sample; (2) The Cooperative French Test (Series Q) measuring reading comprehension skills; and (3) the Cooperative French Listening Comprehension Test (Form B). Experimental design relies heavily on classification of students by intelligence quotient scores. Generalizations drawn from the results reflect the difficulty of objective experimentation and the limitation of this study, referred to in a special section. Statistical data are included in an appendix. (RL)

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A Study of The Effectiveness of Language Laboratories

A Preliminary Evaluation in Twenty-One School Systems of the Metropolitan School Study Council

by

RAYMOND F. KEATING

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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AMERICAN COUNCIL ON THE TEACHING OF FOREIGN LANGUAGES
62 FIFTH AVENUE
NEW YORK, N.Y. 10011

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The assistance of Mr. James H. Williston, Instructor in English and Foreign Languages, was invaluable. It is to Mr. Williston that primary credit must go for devising and arranging for the expert scoring of the Metropolitan School Study Council *French Speech Production Test,* which was the instrument used to assess achievement in speaking skill.

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R. F. K.

Foreword

When first announced, the results of Dr. Keating's inquiry stirred up considerable interest, not to say controversy. The reasons are not difficult to discern. Considerable economic leverage is exerted by the conglomeration of devices that have been tagged by the term "language laboratory." The availability of matching grants, provided because someone in Washington—I do not know who—thought it might be a good idea, has suddenly escalated outlays for this item into nine digits.

A study on the scale of this one, calling the wisdom of the whole idea into question, is naturally going to result in many efforts to explain away the results. So let us begin the process by explaining them away here in the FOREWORD.

First, it should be borne in mind that the degree and frequency of employment of the language laboratory in the schools in which this investigation was made were found to be disappointing. The modal practice was one period per week. However, with results that favor students in classes that were fully teacher-taught, it is hard to see how more frequent periods in the laboratory would change the outcome. This does not mean that there might not be some ingenious means of teaching language in which the laboratory might play a part.

Secondly, the schools in which this investigation was made are all relatively well favored, especially as regards expenditure, compared to schools of the country in general. The superiority of the non-laboratory group may well be the result of an employment policy that obtains superior teachers. Thus it might be shown that where teachers are not well trained, laboratory teaching of language is superior. But this begs the question. Who could seriously advo-

cate that *anything* should be taught by persons not qualified? As for skill in the use of the laboratory itself—or any other teaching device for that matter—if teachers in financially well favored schools are not ingenious enough to employ it to its full potential, it is difficult to see how teachers less well trained or less qualified would be capable of doing so.

If we were to generalize the outcome of this investigation it might be to say: Good language teachers using whatever devices they care to employ are superior to language laboratories in teaching reading and listening comprehension of a foreign language. Language laboratories are effective in developing speech production—but principally in the first year. If a school wishes to employ the language laboratory, its best move in the light of these results is to schedule first year language students into the labs for frequent and intensive exercise in speech production. Once a student "has the tongue in his head," the value of the laboratory appears to have passed its peak.

WILLIAM S. VINCENT
Executive Officer
Institute of Administrative Research
Teachers College
Columbia University

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Chapter I

The Scope and Purpose of the Study

Has the language laboratory contributed to more effective foreign language instruction? To find an answer to this question, the present study was undertaken at a time when the language laboratory had recently been installed in many member schools of the Metropolitan School Study Council. As evidenced by actual installations, articles in the literature, and discussions among teacher groups, the laboratory seemed to be gaining increasingly greater acceptance.

In design, this study is an evaluation of the language laboratory as it is found actually in use in the schools of the Council. A comparison is made between the achievement of pupils when such laboratories are utilized and that of pupils taught without recourse to a laboratory.

According to Hocking, a language laboratory

> . . . is a complete electronic installation which provides a booth, headset, microphone, sufficient recording facilities for every student in the room to record frequently, and monitoring facilities for the teacher.[1]

Hayes, on the other hand, has observed more simply that

> A language laboratory is a classroom or other area containing electronic and mechanical equipment designed and arranged to make foreign language instruction more effective.[2]

[1] Elton Hocking in "Language Learning Today—45 Questions and Answers," *Audio-visual Instruction,* IV, No. 6 (September, 1959), p. 197.

[2] Alfred S. Hayes, "What Is a Language Laboratory?" *Saturday Review,* XLVI, No. 7 (February 16, 1963), p. 70.

As will be made clear, the facility that was evaluated in this instance is the kind of laboratory, with its attendant features, prevailing in the schools in question. As it turned out, the features of such an installation are very similar in all these schools, and it would be expected that they equal or better what is to be found in most schools that have installed laboratories throughout the country.

If the use of the language laboratory actually facilitates the process of learning a language, then that fact should be apparent through tests administered to the pupils to measure their achievement in areas critical to language mastery. There are without question many aspects to mastery of a language. McCarthy[3] has identified several variables that are related to language development and that might therefore serve as the basis of indices of the learner's achievement: the mimetic reproduction of model sounds, listening comprehension, the eclipsing of gesture language by vocal language, growth of vocabulary, relative proportions of the various parts of speech in the total vocabulary, comprehensibility of speech, length of responses to questions, and sentence structure and grammatical form.

Today, a student must demonstrate competency in listening comprehension, reading comprehension, and comprehensibility of speech in order to be successful in the foreign language programs of the public secondary schools. The general acceptance of these three criteria is clearly evident in the literature of the last decade, of which the writings emanating from the United States Office of Education, such as those of Johnston, Remer, and Sievers,[4] a report by the Director of Foreign Languages in New York City,[5] and a Course Guide prepared by the modern foreign language teachers of Montgomery County (Maryland),[6] are representative.

In this study the effectiveness of the language laboratory as now

[3] Dorothea McCarthy, "Language Development in Children," *Manual of Child Psychology*, ed. by Leonard Carmichael (2d ed.; New York: John Wiley and Sons, Inc., 1954), pp. 492-630.

[4] Marjorie C. Johnston, Ilo Remer, and Frank L. Sievers, *Modern Foreign Languages —A Counselor's Guide*, U.S. Department of Health, Education, and Welfare, Office of Education, Bulletin 1960, No. 20 (Washington: Government Printing Office, 1960).

[5] Theodore Huebener, "New York City's Foreign Language Program," *The Modern Language Journal*, XLVII, No. 2 (February, 1963), pp. 62-65.

[6] Montgomery County, Maryland, Public Schools, *Audio-Lingual Presentation of French*, Bulletin No. 150 (Montgomery County, Maryland: Board of Education, March, 1960).

employed was first assayed by testing foreign language students in reading comprehension and listening comprehension. An approach toward the measurement of comprehensibility of speech was also made by testing a sampling of these students for the accuracy of their production of critical sounds common in the native speech of the foreign language being studied. Since the comprehensibility of speech depends largely upon the fidelity of this kind of speech production, the results of a test measuring this skill would also be expected to provide a measure of comprehensibility of speech.

Quite obviously, many factors contribute to speaking a language successfully. In this study an attempt has been made to measure only one speech factor. Nevertheless, because reasonable success in terms of this single factor would seem to be absolutely essential to success in speaking the language, the results obtained in testing for this factor are viewed as an indicator related to the more fundamental concern in foreign language instruction: How well do the students speak the language?

French was chosen as the language for this evaluation. The reasons for this choice are detailed below, but primarily this language was chosen because, among the schools participating in this study, programs in French instruction are more numerous than programs in any other foreign language. It would obviously compound the difficulties, and in no way clarify the results, to test achievement in more than one language.

Stated more exactly, it was the purpose of this study to test the following null hypotheses in relation to the use of the language laboratory to teach French in a group of member school districts of the Metropolitan School Study Council:

A. Students who have used language laboratories are not superior in reading comprehension to students who have not.
B. Students who have used language laboratories are not superior in listening comprehension to those who have not.
C. Students who have used language laboratories are not superior in fidelity of pronunciation to students who have not.

The evaluation of language laboratories thus made is in no way intended to be exhaustive, for it could be argued that the potential of the language laboratory is not fully exploited. Rather than at-

tempt to assess the power of the laboratory as an instructional tool in any abstract sense, this study attempts a limited evaluation of the effectiveness of the language laboratory as it is presently used in a group of Metropolitan School Study Council schools.

This is a group of schools highly favored in many respects. It would be expected that teachers employed in these schools would equal—if not excel—the level of competence of any comparable group of teachers across the country. The use they make of the language laboratory would be expected to be as creative and effective as that which would obtain in any other comparable group of schools. The findings of this study are seen as definitely limited to the circumstances of language instruction, with and without the laboratory, prevailing in the participating schools. But because these same schools are thought to be staffed by teachers who are at least the equal in quality of any comparable group of teachers in the American public schools, the results of this study are also interpreted more broadly as indicative of what instructional benefits—if any—are gained when the laboratory is introduced into instructional programs where relatively high quality teachers are already available to the students.

I. Consequences of World War II Army Specialized Training Program

Much of the current interest in the language laboratory stems from the World War II Army Specialized Training Program. Thus, according to Huebener,

> The widespread installation of mechanical and electronic equipment [the language laboratory] to facilitate the learning of foreign languages came about through the success of the intensive courses of the Army Specialized Training Program.[7]

Parker summarized the "absolute requirements" of the so-called Army method which grew out of A.S.T.P. as these:

1. ample time—hour for hour the Army's "9 months" were equivalent to 6 years of high school language study
2. very small classes

[7] Theodore Huebener, *Audio-Visual Techniques in Teaching Foreign Languages* (New York: New York University Press, 1960), p. 109.

3. superlatively trained teachers—frequently two instructors per class, one a native speaker
4. up-to-date equipment
5. students with a high I.Q. and a strong motivation for language study
6. concentration on language study to the exclusion of everything else.[8]

A more detailed report upon the wartime area and language courses of which A.S.T.P. was but one element was made by Hyneman[9] and Matthew.[10]

The Army method which grew out of A.S.T.P. was designed to produce in short order a good number of personnel sufficiently competent in listening and speaking skills with a foreign language to be able to serve on military missions in foreign lands. Many of the persons given this special training were destined for positions within the military and civilian occupation governments which were foreseen. The success of A.S.T.P. has served to demonstrate conclusively to many people that listening and speaking skills are realistic objectives for foreign language instruction programs.

At the same time, Brickman,[11] Huebener,[12] and Pargment[13] have pointed out very forcefully that a widespread misunderstanding of the kind of success A.S.T.P. really enjoyed has produced an equally serious misunderstanding of the difficulty of the task entailed in the acquisition of listening and speaking skills. Pargment effectively posed the problem that today besets many school administrators:

> The ordinary administrator reasons logically: "if men 25 or older can, in a few weeks, learn to read or to speak a foreign language,

[8] William Riley Parker, *The National Interest and Foreign Languages* (3d ed.), A Discussion Guide Prepared for the U.S. National Commission for the United Nations Educational, Scientific, and Cultural Organization, Department of State Publication 7324 (Washington, D.C.: U.S. Government Printing Office, 1961), p. 91.

[9] Charles S. Hyneman, "Wartime Area and Language Courses," *American Association of University Professors Bulletin,* XXXI (September, 1945), pp. 434-447.

[10] Robert John Matthew, *Language and Area Studies* (Washington, D.C.: American Council on Education, 1947).

[11] William W. Brickman, "The Teaching of Foreign Languages," *School and Society,* LXV (January 25, 1947), pp. 66-71.

[12] Theodore Huebener, "What Shall the Aims of Foreign Language Teaching Be in the Light of Recent Experience?" *High Points,* XXVII (April, 1945), pp. 15-18.

[13] Michael S. Pargment, "On Learning a Foreign Language," *The Modern Language Journal,* XXIX (March, 1945), pp. 198-209.

> and, in a few months, learn to read it well and to speak it fluently, often 'like a native,' it should not be difficult, indeed it should be easier to do the same for our regular students, who are younger! All that is necessary is for the teachers to renounce their antiquated methods and boldly to espouse the newly discovered 'natural' method!"[14]

Quite apart from the question of how valid is the conclusion that many have drawn from A.S.T.P., there is no doubt that the success of this program has been instrumental in the widespread acceptance of both the primacy of listening and speaking aims in foreign language instruction in the public secondary school, and the use of the language laboratory in connection with this instruction.

II. Development and Diffusion of the Laboratory

Nordmeyer and White[15] described an experimental program of intensive German instruction set up at Yale after World War II which was designed to incorporate some of the important features of A.S.T.P. Ten hours a week were allotted to the program; provision was made for carefully supervised practice sessions conducted by native speakers in groups never larger than ten and usually less than eight. These practice sessions provided the opportunity for the kind of overlearning of speaking and listening skills that has been stressed by Brooks[16] as an essential part of language learning.

Other colleges later introduced programs of this type that depended upon language laboratories for this kind of overlearning. The use of the language laboratory on the college level was reported as early as 1947.[17]

The results of a survey conducted by the U.S. Office of Education and the Modern Language Association in 1957 indicated that sixty-four public and private secondary schools and two hundred and

[14] *Ibid.*, p. 201.

[15] George Nordmeyer and James F. White, "Intensive German at Yale," *The German Quarterly*, XIX, No. 1 (January, 1946), pp. 86-94.

[16] Nelson Brooks, *Language and Language Learning—Theory and Practice* (New York: Harcourt, Brace and World, Inc., 1960).

[17] Joseph C. Hutchinson, *Modern Foreign Languages in High School: The Language Laboratory*, U.S. Department of Health, Education, and Welfare, Office of Education, Bulletin 1961, No. 23 (Washington: Government Printing Office, 1961), pp. 1-2.

forty public and private institutions of higher education used language laboratories for foreign language instruction.[18] Just four years later, in 1961, the U.S. Office of Education estimated that twenty-five hundred secondary schools and seven hundred colleges and universities were then using language laboratories.[19] According to William Riley Parker,[20] first Chief of the Language Development Section in the U.S. Office of Education under the National Defense Education Act of 1958, $22 million, including federal and matching state monies, were spent on "language laboratory and other special equipment (e.g., audio-visual materials), and on minor remodeling of classrooms to accommodate new equipment" during the period 1958-60. More recently, Donald D. Walsh,[21] Director of the Foreign Language Program of the Modern Language Association, reported that by 1962 the number of laboratories in public secondary schools had reached five thousand.

Even while this rapid diffusion of the laboratory was in progress, Parker[22] pointed out that, to be effective, laboratories require special skills of teachers and specially prepared teaching materials. This same writer pointed out that without adequate provision for teacher training and materials, the "language boom" might well turn into a "crash and national scandal."

A committee of the Northeast Conference on the Teaching of Foreign Languages also cautioned in 1961 that:

> Too often a laboratory is installed only because "it is the thing to do," with no consideration of the needs of the school in question, and with no awareness of the fact that the proper and efficient utilization of the laboratory will require a thorough revamping of traditional courses, a total reorganization of the language program, as well as a redefinition of its objectives, and, most likely, an increase in the teaching staff.[23]

[18] *Ibid.*, p. 2.
[19] *Ibid.*, pp. 3-4.
[20] Parker, *op cit.*, p. 12.
[21] Donald D. Walsh, "The Role of the NDEA," *Saturday Review* (February 16, 1963), p. 73.
[22] Parker, *op cit.*, p. 14.
[23] Northeast Conference on the Teaching of Foreign Languages, *Modern Language Teaching in School and College—Reports of the Working Committees* (New York: New York University, 1961), p. 53.

III. Other Studies of the Effectiveness of the Language Laboratory

Although the literature abounds with articles that describe the benefits of using language laboratories and detailed information about the way they are or might be used, it contains virtually no reports upon the empirical validation of the language laboratory as used in the public schools.

In what appears to be the only exception, Edward D. Allen reported upon the effects of the language laboratory on the development of skills in a foreign language.[24] Allen's study involved fifty-four students of elementary and intermediate modern foreign languages at the Center for School Experimentation of Ohio State University. Students were paired on the basis of tests in vocabulary, spelling, and aptitude for language learning. The laboratory and no-laboratory students were part of the same instructional program, except that one day a week half of the students reported to the laboratory, while the other half remained in the regular classroom. When both groups were later tested, the laboratory students showed better achievement in reading and listening skills. The results of the speaking test administered indicated, however, that the laboratory students did no better than the no-laboratory students.

While the results of Allen's study are certainly quite interesting, they would seem to be severely compromised by the conditions under which instruction proceeded. From a reading of the report it seems difficult to avoid the conclusion that the laboratory students would be more highly motivated. Every teacher can attest to the great delight which students often take in being excused from regular classroom work for almost any reason. Not only would one expect the motivation of the laboratory students in this study to be greatly benefited by the kind of privilege they seemed to enjoy, but one would also expect the motivation of the no-laboratory students to be depressed—during the time that their counterparts

[24] Edward D. Allen, "Effects of the Language Laboratory on the Development of Skill in a Foreign Language," *The Modern Language Journal*, XLIV (December, 1960), pp. 355-358.

were enjoying the benefits of a dramatically different instructional setting, the no-laboratory students' instruction program seemed to consist of little more than a free reading period.

Meanwhile, a much more elaborate study of the effectiveness of language laboratories has been in progress in the New York City Public Schools for some time.[25] As of this writing no data relative to the effectiveness of language laboratories have been published.

[25] *Using Laboratory Techniques in Teaching Foreign Languages in New York City Schools,* Curriculum Research Report (New York: Board of Education of the City of New York, Bureau of Curriculum Research, 1961).

Chapter II

The Setting for the Study

The Metropolitan School Study Council consists of about seventy member school districts in the New York metropolitan area. The communities represented in the Council are favored by those economic and sociological factors that have been shown to be highly related to the quality of schools by numerous research studies carried out over a period of more than twenty years.[1] According to Ross, the Council

> . . . can be considered a laboratory for seeing what is happening on the "growing edge" of education. There is reason to believe that what the most favored schools are doing now can provide a predictive pattern for schools in general. By studying the conditions that make for excellence in instruction, it is possible to see what community or school characteristics must be protected, maintained, created, or substituted for in all communities.[2]

Because the M.S.S.C. is an affiliate of the Institute of Administrative Research at Teachers College, Columbia University, the great resources of the College and many research-minded school districts, in terms of educators, materials, and students, were readily available for the present study. The investigator was very often able to meet personally with many of the instructional leaders of M.S.S.C. member schools both at the College and in the local districts. On one occasion a special interest meeting was held at Teachers College to

[1] Donald H. Ross (ed.), *Administration for Adaptability* (New York: Metropolitan School Study Council, 1958).
[2] *Ibid.*, p. 546.

bring together the instructional leaders of all M.S.S.C. member districts for the express purpose of discussing the questions relating to the current and prospective use of the language laboratory.

I. Foreign Language Instruction in the Schools of the Council

As a prelude to the present study, a survey of the foreign language programs in M.S.S.C. schools was undertaken in the fall of 1961. The results of this survey indicated that thirty-nine school districts were using the language laboratory, while thirty-five were not using the laboratory. Thirteen districts reported the installation of the laboratory in 1961; sixteen others had made their installations in 1960. Eight districts reported installations in 1959 and one in 1958. The only remaining installation reported—the earliest—was made in 1956.

Districts reported using the laboratory in connection with instruction in six languages: French, Spanish, German, Latin, Russian, and Italian. French and Spanish instruction were by far the most frequently reported. Thus, thirty-six districts reported using the laboratory for French instruction and thirty-four districts reported its use for Spanish instruction. There were nineteen cases with German reported, eight each with Russian and Latin, and two with Italian.

II. Language Laboratories in the Schools of the Council

Following the preliminary survey of language instruction, a questionnaire was used to obtain information on the general circumstances under which the laboratory students work. Most districts reported that only one room had been equipped as a laboratory. In only six cases did a district report that three or more rooms had been equipped. In the typical situation, thirty student positions and a single teacher's control console comprised the single classroom laboratory installation. The typical student position was furnished with a booth, a microphone, and student earphones with individual volume control. In six cases it was reported

that all student positions in an individual classroom installation were equipped to permit the student to record at his position. All districts reported the use of tapes as a program source. Estimates of the installation cost per student position ranged from $200 to over $500, with the typical student position costing approximately $300.

As for subjective appraisal of the laboratory and its use, most respondents indicated that pupils experienced decided improvement in motivation, fidelity of pronunciation, and speed of learning. More than half of the respondents indicated that the results obtained thus far seemed to justify expanding the language laboratory facilities. While some respondents indicated that it was still "too early" to make such a determination, no respondent stated flatly that the results obtained thus far did not seem to justify expansion of facilities.

In an average week, one or two student positions were out of use due to mechanical failure. However, in almost all cases the respondents indicated satisfaction with the technical performance of the laboratory equipment. In only three cases did respondents rate their equipment as poor. In these cases the dissatisfaction was related to such acoustical features as the fidelity of reproduction.

In almost every case it was reported that both commercial and teacher-produced materials were used for basic programming. In most cases no estimate of the time required by the teacher to prepare such materials was reported. Several respondents, however, reported three hours per week for such work by the teachers. In only five cases was it reported that the teachers were freed from other duties to prepare such programs. While in one case students were scheduled in the laboratory for only one-half hour per week, and in two cases students were scheduled into the language laboratory for two hours per week, the great majority of cases provided for one classroom period per week, presumably a period of about forty-five to fifty minutes. It was very striking that only one district reported that the time a student spent in the language laboratory contributed to an actual increase in total regularly scheduled class time spent with the target language. In all other cases, it was reported that the time regularly spent in the language laboratory actually replaced regularly scheduled class time that had been spent

with the target language prior to the introduction of laboratories.

What all this adds up to is something much less than foreign language instruction permeated by laboratory use. Where the laboratory is used, the typical program entails only one period a week with the laboratory. It is clear too that because the laboratory is not being used in a way that permits each student more contact hours per week with the target language, the student's opportunity for the kind of overlearning of speaking and listening skills emphasized by Brooks[3] is not substantially improved.

Nor are the principles of sound "supplemental" or "adjunct" auto-instruction as developed by Pressey[4] observed in the typical program using the laboratory. In short, it appears that current usage of the laboratory as found in these schools does not provide the student with any quantitative improvement in opportunity for language instruction. This much can be shown by simple arithmetic. It is less easy to demonstrate, but nevertheless quite probable, that the laboratory typically affords the student little or no qualitative improvement in opportunity for language instruction either. This latter speculation is based upon the observation that few laboratory installations found in the schools cooperating in this study capitalize upon the very features which their apologists identify as their principal contributions to the instructional program. But, of course, it has been the purpose of this study to produce empirical evidence bearing upon just this point: the effectiveness of the language laboratory as presently used in certain schools. This study does not attempt to indicate what the result might be under some ideal and highly creative program of language instruction, into which the laboratory would be integrated according to organizational principles not yet widely accepted.

[3] Nelson Brooks, *Language and Language Learning—Theory and Practice* (New York: Harcourt, Brace and World, Inc., 1960).

[4] Sidney L. Pressey, "Teaching Machine (and Learning Theory) Crisis," *Journal of Applied Psychology*, XLVII, No. 1 (February, 1963), pp.1-6.

Chapter III

The Design of the Study

Only students receiving French instruction participated as subjects in the study. French was chosen because of the larger number of students, the availability of suitable test instruments, and the availability of technical assistance which was required in the developmental phase of the appraisal program. The use of the laboratory was most prevalent in French instruction in the Council districts surveyed. Effective test instruments, furthermore, were available from Educational Testing Service[1] for measuring achievement in reading and listening comprehension of French. The cooperation of James H. Williston, Instructor in the Teaching of English and Foreign Languages at Teachers College, Columbia University, made available to the study expert technical counsel and assistance, especially in the construction of the Metropolitan School Study Council *French Speech Production Test*[2] and provision for its expert scoring.

More than five thousand students in twenty-one school districts were tested in the course of the study. Approximately three thousand of these students made up the laboratory group. These students had been using the laboratory during the school year in which they were tested. Two thousand had had no experience in learning

[1] *Cooperative French Test, Series Q* (Princeton, New Jersey: Cooperative Test Division, Educational Testing Service, 1940), and *Cooperative French Listening Comprehension Test, Form B* (Princeton, New Jersey: Cooperative Test Division, Educational Testing Service, 1955).

[2] *French Speech Production Test* (New York: Metropolitan School Study Council, Teachers College, Columbia University, 1962).

French by means of a laboratory and hence may be referred to as the no-laboratory group. Each student was identified by I.Q. on whatever intelligence test the school employed, and according to the number of years of experience in the study of French. All test results obtained with students who had resided in France for a year or more were eliminated.

Years of experience in the study of French were identified by *level*. Level I included all students who, at the time of testing (late in May), were completing their first year of French study. Levels II, III, and IV in like fashion included all students who were completing their second, third, and fourth year of French study.

An intelligence control was provided by classifying all students according to I.Q. As explained below, five I.Q. classes were established—top, high, medium, low, and bottom—on the basis of distribution of scores in the standardizing populations of group I.Q. tests employed in the cooperating schools. Each student was assigned to the I.Q. class appropriate to the score he had earlier obtained on a particular I.Q. test, the necessary information having been obtained from school records.

I. Evaluation Procedures

Achievement in three language skills was made the basis of comparison between the laboratory and no-laboratory groups. These skills were reading comprehension, listening comprehension, and speech production. The last skill, for the purposes of this study, was defined as the demonstrated ability of the student to pronounce, in the fashion of the native French speaker, certain key sounds which, while common in the French tongue, have been found to constitute learning problems for native English speakers.

Through the cooperation of the local school districts, all the students were tested in reading and listening comprehension during the last two weeks of May. This testing was accomplished by means of group tests.

Students were tested for speech production by individual examination with the Metropolitan School Study Council *French Speech Production Test*. Because this is an individual test, requiring the respondent to enunciate into a microphone, with his re-

sponses recorded on tape, considerable time is required for administration and auditing the tape. For this reason the speech production test was administered on the basis of a 10 per cent sample. Five hundred and nineteen students in twelve school districts were involved in this phase of the study.

Reading Comprehension

Reading comprehension was tested by the administration of Part I of the Cooperative French Test (Series Q), which is published by Educational Testing Service. The elementary form was administered to Levels I and II; the advanced form was administered to Levels III and IV.

Part I of this test is a fifteen-minute subtest of reading comprehension. Both elementary and advanced forms use multiple-choice items exclusively. The elementary form of this subtest is composed entirely of forty sentence completion items. The advanced form uses for this subtest twenty-nine items that relate to word and sentence meaning and sixteen items that relate to the interpretation of four paragraphs. The Cooperative French Test has appeared in several series over a period of many years and has received general acceptance as a sound and well-constructed test. The publisher, E.T.S., has reported a reliability coefficient of .90[3] for this test and a correlation coefficient with school marks of .70.[4]

Listening Comprehension

Listening comprehension was tested through the administration of the Cooperative French Listening Comprehension Test (Form B), which is also published by Educational Testing Service. Because this test was not developed for use with beginning students and is recommended for use only with students at higher levels of experience with French instruction, only students at Levels II, III, and IV were tested for listening comprehension in this study. The test consists of forty-two items of the multiple-choice type. The test items are presented to the student by tape recording. The student indicates his response to each item by choosing among several sug-

[3] *The Cooperative Achievement Tests—Introduction to the Norms* (Princeton, New Jersey: Cooperative Test Division, Educational Testing Service, 1938), p. 9.
[4] *Ibid.*, p. 11.

gested answers in his test booklet. The total working time for the test is about thirty minutes.

The test is divided into four parts and is designed to test phonetic discrimination, comprehension of isolated questions, sentence meaning, and passages, each of which presents a description, scene, or incident that is complete in itself. The test manual reports a reliability coefficient of .87[5] and correlation with teacher ratings of from .42 to .79 with a median correlation of .54.[6] Such correlation coefficients would seem to give credibility to the claim made in the test manual that "there is a substantial relationship between scores on the test and teachers' ratings of the students' abilities."[7]

Speech Production

Five hundred and nineteen students in twelve school districts were tested with the Metropolitan School Study Council *French Speech Production Test.* This was a test constructed specifically for the purpose of the current investigation, and requires individual examination of each student. It consists of twenty items. Each of the first ten items requires the student to respond with one French word; each of the last ten items requires the student to read aloud in French simple brief sentences each of which contains a key word. (See Appendix B.) The responses of each student were recorded on tape and identified by a student code number.

The test was constructed with the objective of requiring the student to pronounce key French words which contain certain critical sounds that are common in the spoken French language and at the same time of unusual difficulty for the French student who is a native speaker of English. The total test actually requires the student to produce each of ten such critical sounds on two occasions: once in isolation as part of a single word, and again as part of a word used in a brief sentence. The writer is indebted to James H. Williston, who assisted in the construction of this test and the development of a method of scoring.

In the construction of test items, every effort was made to make the task of the student as easy as possible in every way other than

[5] *Cooperative French Listening Comprehension Test—Examiner's Manual* (Princeton, New Jersey: Cooperative Test Division, Educational Testing Service, 1955), p. 25.
[6] *Ibid.*, p. 27.
[7] *Ibid.*

the actual production of the critical sounds. Thus, in order to avoid using items that would test primarily vocabulary and/or reading, only French words ranking high in frequency listings were used. In addition, in Part I where only single-word responses were required, each item was presented by means of an individual card that featured a simple line drawing of a common object labeled appropriately in English. The student was required to produce the name of the object in French. Likewise, each sentence in Part II was presented on an individual card.

The administration of the Metropolitan School Study Council *French Speech Production Test,* while requiring the individual examination of students, does not require any knowledge of French on the part of the examiner. Simple instructions in English are given to each student explaining the nature of his task. The examiner then has only to activate a tape recorder, read onto the tape a coded student identification number, and stop the tape recorder after the student's response to the last test item. No time limits were used in the test.

Two raters later listened to the tapes and recorded on rating sheets, specifically prepared for this purpose, their evaluation of each response of every student as "poor," "average," "good," or "no response" (the last in instances where an unintelligible response or no response at all was given). The raters worked under circumstances that permitted them the opportunity at first to identify and agree upon the criteria they would apply, but that then required them to make their ratings independently and without in any way identifying the school or experience level of the students involved in the study. Each rater's findings were checked against the other's through the calculation of correlation coefficients. These results are reported in Chapter IV.

Controls

It could well be argued that, by virtue of the number of students involved in the study and the relatively homogeneous character of the educational settings from which they were drawn, it would be unlikely that appreciable differences in I.Q. would exist between the laboratory and no-laboratory groups. Yet, because of the undeniable importance of I.Q. as a determinant of academic achieve-

ment of all kinds, especially where language is involved, provision was made to classify the participating students according to I.Q.

For each student an I.Q. score and the name of the test on which the score was obtained were collected from school records. It was found that the I.Q. scores thus obtained were based on six widely used group I.Q. tests.

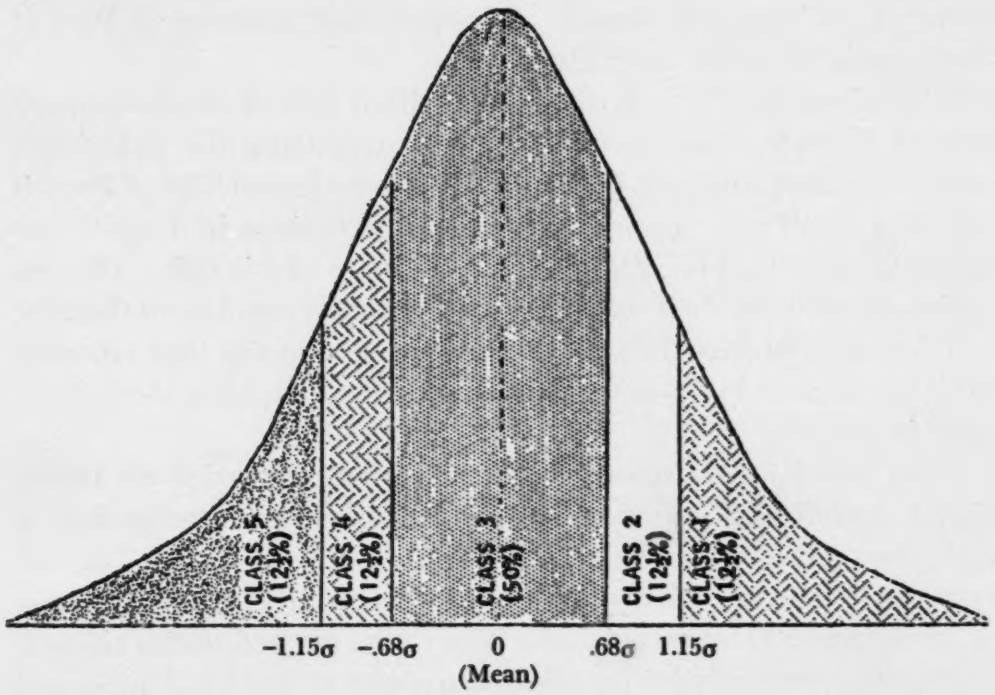

FIGURE I

THE FRACTIONATION OF THE NATIONAL POPULATION OF A GROUP I.Q. TEST INTO FIVE CLASSES DEFINED IN TERMS OF THE STANDARD DEVIATION OF THAT TEST

Figure 1 illustrates the method by which five I.Q. classes were established for each of the group I.Q. tests on which the I.Q.'s of students were reported. This figure merely reflects well known characteristics of the normal distribution. Hence it is well established that 50 per cent of the cases within a normal distribution fall within the limits set by cases .68 sigma above and .68 sigma below the mean of the distribution. The I.Q. mean for every test is, of course, 100. The standard deviations, different for each test, may roughly be equated as encompassing comparable proportions of the distributions. By using as class limits the sigma values shown

in Figure 1, five I.Q. classes were so constructed that students with the highest I.Q.'s were included in class 1 and students with the lowest I.Q.'s were included in class 5.

It is important to note that the percentages of total cases indicated for each I.Q. class in Figure 1 relate only to national populations with reference to which the group tests were standardized. Thus one would expect I.Q. class 1 to include approximately 12½ per cent of the cases in a sample only if this sample were a random sample drawn from a national population. This condition would obviously not apply to the students who participated in this study. It would be fatuous, for example, to believe that the students at Level IV who had studied French for four years represented a random sample drawn from a national population. For this reason, therefore, the percentages of the total students that are included within each of the I.Q. classes would not be expected to coincide with the percentages presented for these I.Q. classes in Figure 1. As would be expected, relatively few students participating in the present study fell within the lower I.Q. classes. This was especially true at the higher levels of experience with French instruction.

A second control was employed relative to the level of expenditure of the schools in the test group. The reason for this is the strong positive relationship shown in many studies carried out by the Institute of Administrative Research at Teachers College, Columbia University,[8] between the level of net current expenditure per pupil unit and the quality of education. It might be expected, for example, that the results might be influenced by the caliber of teaching. If higher salaries, possible to schools with higher expenditure, should result in superior teaching staffs, then a second control should be employed to determine whether any such influence actually occurred. Since the net current expenditures per pupil unit of all schools participating in this study are collected annually as part of finance studies carried out by the Institute and its affiliated organizations, the NCE's per pupil unit for 1961-62, the year of the present study, were readily available.[9] It was then ascertained that the median 1961-62 NCE for all school

[8] Donald H. Ross (ed.), *Administration for Adaptability* (New York: Metropolitan School Study Council, 1958), pp. 382-391.

[9] Metropolitan School Study Council, *Financing Council Schools, 1961-62* (New York: The Council, 1962).

districts included within the present study was approximately $600 per pupil unit. For the purposes of this study, therefore, all school districts with NCE's above $600 were considered to be high expenditure districts, while all school districts with NCE's below $600 were considered to be low expenditure districts.

II. Special Limitations

In assigning students to the laboratory or no-laboratory groups, the determining factor was the information reported by the coordinator of the study in the local school districts. Thus, the question of who was using or not using a language laboratory was answered at the local school district level. This fact is, of course, of great importance in interpreting the findings of this investigation. There would seem to be at least as many varieties of language laboratories on the market today as there are automobiles. And just as in the case of automobiles, where many differences shown by the great variety of models are certainly not of essential importance in relation to their primary function, it would seem to be only reasonable to point out that, in terms of the application made of them, many of the differences among particular language laboratories are more apparent than real.

Any attempt to offer a more sophisticated definition of a language laboratory than the definition of Hocking and Hayes cited in Chapter I would not only be irrelevant to the purposes of this study but, even more than that, very misleading. Some information about the kinds of equipment and the use to which they were reportedly put was given earlier. This should afford some basis for understanding the meaning of "language laboratory" relevant to the scope of this investigation.

No claim can be made that this study evaluated the use of the language laboratory as implemented according to any single instructional rationale. Nor was any attempt made in the present study to define *a priori* what a language laboratory is. Yet, while it is essential to note that assignment of students to the laboratory or no-laboratory group was actually based upon the judgment of the local school district coordinator, a study of additional information provided by the local district coordinator as well as several

on-site inspections made personally by the investigator show that both the definitions of Hocking and Hayes would seem to be highly appropriate to the kinds of language laboratory installations in the schools cooperating in the present study.

A second limitation arises from the evaluation procedures. Even if the tests that were applied were valid instruments for measuring the specific skills they were intended to measure, it would be presumptuous indeed to deny that there might be a great many other instructional benefits to be gained through the use of the language laboratory which were neither identified nor measured in this study. This consideration would appear to be especially appropriate in the area of oral skills. It would indeed be fatuous to claim that these skills were measured in any full sense by the Metropolitan School Study Council *French Speech Production Test.*

As certain results which are reported below would seem to indicate, this test may have been highly successful in measuring validly and reliably the specific skills it was designed to measure. Nevertheless, it would not be at all difficult to cite many other kinds of factors that would enter into the successful use of the spoken language which are not measured by this speech production test at all. While pointing out this particular limitation of the evaluation procedure, it would seem important, nevertheless, to recognize that this particular limitation is by no means unique to this study. On the contrary, the problem of objectively evaluating achievement in oral skills in foreign language programs in a valid and reliable fashion, remains largely unsolved.

A third limitation of this study—but presumably a much less serious one—arises from its attention to the use of the language laboratory with French instruction only. While reasons for having chosen French instruction have been offered above, the assumption being made of course is that the results of this study have general significance and are not a function of the particular foreign language. In this connection it might be observed that, if anything, the choice of French might provide the laboratory with the best opportunity to demonstrate its instructional power. Because of the popularity of French—as indicated in the survey reported earlier—it would seem reasonable to expect that the use of the language laboratory in French instruction programs would be as sophisti-

cated as it is in any other foreign language instruction program, if not more so. This would be the result of the greater opportunity for the development of suitable materials and the acquisition of laboratory experience by the French teacher.

A fourth limitation of this study is at the same time a feature lending unusual significance to the results obtained. These contrasting outcomes derive from the fact that this study cannot be considered an experiment in any proper sense. And yet, the design of the study avoided the influence of the so-called "Hawthorne effect." That is, since all the students tested were involved in ongoing programs, there is no reason to believe that any elevation in achievement scores could be attributed to the special motivation and efforts induced by the students' awareness of their participation in a study.

Chapter IV

Results of the Comparison of Laboratory and No-Laboratory Groups on Three Measures of Achievement

The basic design of the study was intended to test what in the statistical vernacular is known as the null hypothesis. The language laboratory would, of course, hardly be installed in any school unless there was a clear expectancy that instructional benefits would be derived from its use. Yet for the purposes of this study, it was hypothesized that there would be no difference in instructional outcomes between programs using the laboratory and those not using the laboratory.

Were the results of the study to substantiate this hypothesis, the implications of such a finding would be of great relevance to those upon whose decision the installation and utilization of language laboratories depend. The burden of proof would be upon those attempting to justify employment of a laboratory at all, in view of its cost.

While this consideration might appear perfectly obvious, it is important to take formal note of it, because its recognition adds perspective and greater meaning to the actual findings. For in many of the comparisons made between the laboratory and no-laboratory groups in this study, the results required the rejection

of the null hypothesis, but not for the reason that would have been expected at the outset. The study reveals many instances of significant differences between the two groups studied, but, with one notable exception, *none of these differences favor the laboratory group.*

The results show a pattern of superior achievement by the *no-laboratory* students in all three skills tested—reading comprehension, listening comprehension, and speech production. The single exception to this pattern is found at Level I in the test of speech production.

With respect to this latter case of speech production at Level I, the proportion of responses of first year laboratory students given a rating of "good" in speech production was significantly greater than the proportion of responses of first year no-laboratory students given this highest rating. Likewise, the proportions of responses of first year laboratory students assigned lower quality ratings in speech production were significantly smaller than the proportions of the responses of first year no-laboratory students so rated. This single difference in favor of the laboratory group on the speech production test disappears at Level II, and at Level III the no-laboratory group is superior.

With respect to reading comprehension and listening comprehension skills, on the other hand, the results are completely consistent. In all cases where significant differences between the performance of the laboratory and no-laboratory students were found, the differences favored the no-laboratory students.

Another pattern is also interesting to note. In almost all cases where significant differences between the two groups are found, the scores of the laboratory students are found to lag about 10 per cent behind the scores of the no-laboratory group.

When the laboratory and no-laboratory students were classified according to I.Q. and comparisons were made on the basis of reading comprehension and listening comprehension, very significant differences favoring the no-laboratory students were found, especially within the higher I.Q. classifications—more specifically, among those students whose I.Q. scores placed them among the upper 25 per cent of the national populations on which the respective I.Q. tests were standardized. This result was confirmed at all

experience levels in tests for both reading comprehension and listening comprehension.

I. Reading Comprehension

As seen in Table I, the no-laboratory group scores in reading comprehension exceed those of the laboratory group at each level of experience. The size of the differences is seen to vary from 1.71 score points at Level IV to 3.21 score points at Level III. At Levels I, II, and III the differences between the scores of the two groups are found to be significant at the .001 level. The difference at Level IV falls just short of significance at the .05 level.

Disregarding the insignificant difference at Level IV and considering only highly significant differences at the lower three levels of experience, it becomes apparent that the ratio of the mean scores of both groups does not vary greatly from one level to another. Thus, while the scores of both groups show gains at the higher levels of language, as one would expect, the ratio of the laboratory group scores versus the no-laboratory group scores is seen to vary only from .88 at Level I to .92 at Level II and .88 at Level III. Considered differently, it is evident that, at all three levels where significant differences are found, the scores of the laboratory group lag about 10 per cent behind that of the no-laboratory group.

II. Listening Comprehension

As seen in Table II, the listening comprehension scores of the no-laboratory group exceed those of the laboratory group at each of the three levels of experience that were tested, that is, Levels II, III, and IV. The scores at Level III and Level IV are significant at the .001 level; the score at Level II is significant at the .05 level. The differences range from .73 points at Level II to 2.47 points at Level IV and 3.52 points at Level III. The ratio of the score of the laboratory group to the score of the no-laboratory group is .97 at Level II, .89 at Level III, and .93 at Level IV. Therefore, while the scores of the laboratory group are seen to lag about 10 per cent behind the no-laboratory group at all levels tested for listening

comprehension, the laboratory group is seen to compare most unfavorably to the no-laboratory group at Level III.

III. Reading Comprehension by I.Q. Classification

What about the influence of intelligence? It could be argued that in groups of this size the influence of intelligence would average out. But selective factors might be operating.

As a check on this possibility, the test results of the laboratory and no-laboratory groups in reading and listening comprehension were subjected to a further analysis according to I.Q. Thus, as would be expected, it was generally found that at each level of experience with language instruction, the reading comprehension test scores varied directly with I.Q. But, more important to the purpose of this study, it was also found that in all cases where significant differences were found between the reading comprehension scores of the laboratory and no-laboratory students within the same I.Q. class, the direction of the differences always favored the no-laboratory group of students.

Table III shows that at Level I high I.Q. students who do not use the laboratory achieve significantly better in reading comprehension than their counterparts who use the laboratory. Thus, highly significant differences in reading comprehension scores favoring the no-laboratory group are found with I.Q. classes 1 and 2, which include students in the top 25 per cent of the national population, as explained in Chapter III. The other differences between the reading comprehension scores of laboratory and no-laboratory students with average and lower I.Q. students (classes 3 and 4) found at Level I are insignificant. This is the principal point at which the null hypothesis was substantiated, that laboratory and no-laboratory groups would exhibit no differences. Many have argued *a priori* that students of average and lower I.Q. would gain more from language laboratories than students of high I.Q. We find that they do not gain over their no-laboratory counterparts, but that high I.Q. laboratory students lose more.

Tables IV, V, and VI report differences at Levels II, III, and IV that correspond to the differences at Level I reported in Table III. In each case where significant differences are found, the pattern

remains the same—high I.Q. students who do not use the laboratory achieve better in reading comprehension than do their counterparts who use the laboratory. Only on Level III is a significant difference found between the reading comprehension scores of the laboratory and no-laboratory groups with students of average I.Q. As in the case of all the other differences reported in Tables III through VI, this latter difference favors the no-laboratory students.

IV. Listening Comprehension by I.Q. Classification

When the same kind of analysis of reading comprehension test results was made of the listening comprehension test results, as described above, the general findings were exactly the same. Thus, at each level of experience, the listening comprehension test scores generally vary directly with I.Q. Furthermore, in all cases where significant differences are found between the scores of the laboratory and no-laboratory students within a particular I.Q. class, the differences favor the no-laboratory students.

Table VII shows that at Level II, the first level tested for listening comprehension, high I.Q. students who do not use the laboratory achieve better in listening comprehension than students who do use the laboratory. The only significant difference found at this level of experience occurs within I.Q. class 1, which includes students within the top 12½ per cent of the national population relative to I.Q., as explained in Chapter III.

Tables VIII and IX which report upon listening comprehension scores at Levels III and IV also show that high I.Q. students who do not use the laboratory achieve better than their counterparts who use the laboratory. At both of these levels the pattern seen at Level II is repeated; that is, all the significant differences that are found favor the no-laboratory group and occur with students with the highest I.Q.'s, namely class 1.

V. Speech Production

The taped test record of each student examined with the Metropolitan School Study Council *French Speech Production Test* contained twenty responses. Each rater later listened to these responses

and assigned each response to one of four response categories. The rater assigned to the category called "no response" all responses which were either inaudible, unintelligible, or completely inappropriate to the corresponding stimulus. Thus, the "no response" category would embrace situations in which the student actually did not respond at all, as well as situations in which the student responded with French words which, although possibly acceptable with respect to pronunciation, were completely inappropriate to the particular test item presented. "Poor" responses were assigned to category 1, "adequate" responses to category 2, and "good" responses to category 3.

Table X presents the proportion of all the speech production responses at Level I that were assigned by the two raters to each of the four response categories. The differences between the proportions of the responses of the laboratory and no-laboratory group are significant at the .001 level within categories NR ("no response"), 1 ("poor"), and 3 ("good"). Only within category 2 ("adequate") is the difference between the proportions of each group found to be without statistical significance.

The most extraordinary single finding of the whole study is reported in Table X. The difference in proportions seen in category 3 was the only significant difference found in the entire study in which the laboratory group was favored. Inasmuch as responses of the highest quality were assigned to category 3, this significant difference indicates that in speaking the test words of the speech production test, the *first year* laboratory students were superior to the first year no-laboratory students.

Tables XI, XII, and XIII show the proportions of speech production responses assigned to each of the four categories for the laboratory and no-laboratory groups separately at Levels II, III, and IV. The results reported in these tables are interesting in that they emphasize the uniqueness of the difference favoring the laboratory group, presented in Table X. Not only are no similar significant differences favoring the laboratory group found at these three higher levels of experience, but where significant differences do appear they consistently favor the no-laboratory group. At Levels III and IV, for example, the proportions of no-laboratory speech

production responses assigned to the highest quality category, category 3, were found to be significantly greater than the proportions of laboratory responses assigned to this same category.

Consistency Between Raters in the Application of Speech Production Instrument

In order to measure the consistency of the two raters in evaluating the student responses obtained by the application of the Metropolitan School Study Council *French Speech Production Test,* two scores were calculated for each student tested for speech production by weighting the ratings assigned to each response of each student. Three points were awarded for "good" responses, two points for "adequate" responses, one point for "poor" responses, and no points for "NR" responses. Thus, inasmuch as there were twenty test items, sixty points was the highest possible score and, of course, zero the lowest.

Five separate product-moment correlations were calculated between these scores based upon the two raters. The inter-rater correlation, taking together all students at all four levels of experience, was .91. Taking the students at each level separately, correlations of .91, .86, .85, and .79 were found at Levels I, II, III, and IV, respectively.

Correlation coefficients of this magnitude and direction are consistent with two important considerations. First, they provide good reason to believe that the raters were indeed consistent not only in their verbal agreement as to the criteria for evaluation but also more importantly, in the application of these criteria to the rating process. Secondly, the diminution of the correlations toward the upper levels of experience would be expected on the basis of the *a priori* judgment that toward the upper experience levels the population of students would become increasingly more select. It is a well established fact that scores obtained with groups characterized by a wide range of ability show a higher reliability than scores obtained with groups characterized by a narrow range of ability.

It is concluded, therefore, that this test instrument as used in this investigation was highly reliable.

VI. Select Laboratory Groups Versus No-Laboratory Groups

In all the comparisons between laboratory and no-laboratory groups thus far drawn, it should be noted that at each level of experience the laboratory group has included all students who used the language laboratory during the year they were tested in connection with the present study. No differentiation was made as to laboratory experience in years previous. Thus, at Level II, the laboratory group might well include students who had used the language laboratory for one year or two years, and at Level III the laboratory group might well include students who had used the language laboratory for one, two, or three years. There was but one criterion for inclusion in the laboratory groups as referred to up to this point, namely, use of the language laboratory during the year of the study.

Obviously, the comparisons made thus far do not permit a fair estimate of the gains that might be found where students used the laboratory at each of the levels on which they had instruction. In order to permit estimates of possible gains shown by students with a history of laboratory use at each level of instruction, groups of students identified as "select laboratory" were drawn up.

The criterion for membership in the *select laboratory group* at Level II is two years of language study with the use of the language laboratory; the criterion for membership in the *select laboratory group* at Level III is three years of language study with the use of the laboratory. Therefore, the number of years of experience of French instruction is the same as the number of years of experience with the language laboratory for the *select laboratory groups* at both Levels II and III. Of course, this relationship necessarily obtains at Level I in the case of the group that has been hitherto designated simply as the laboratory group. All students in this latter group must have had one year of French instruction and also one year of experience with the language laboratory. For this reason, the criterion applied to the members of the laboratory groups at Levels II and III for the purpose of drawing up the new *select* groups would, if applied at Level I, fail to identify any group of students other than that group hitherto examined.

An insufficient number of students with four years' experience with the laboratory was found to use the same rule in setting up the criterion for membership in a *select laboratory group* at Level IV. For this reason, the criterion for membership in the *select laboratory group* at Level IV was set at four years of language study with at least three of these accompanied by the use of the laboratory, with the additional requirement, of course, that the student have used the laboratory in the current year.

Tables XIV through XVIII present the comparisons between laboratory and no-laboratory students when we view them in terms of these *select laboratory groups.* Three important generalizations may be made at the outset about these five tables.

First, smaller numbers of students enter into the comparisons made. This, of course, is a result of the fact that fewer students qualified for membership in the *select laboratory groups* represented in these tables than qualified for the laboratory groups represented in previous tables.

Secondly, fewer significant differences are found between the *select laboratory* and no-laboratory groups. This might well be the outcome of the smaller numbers of students involved in these comparisons.

Thirdly, and perhaps most important, all the significant differences reported in these tables favor the no-laboratory group. Thus, the pattern seen so consistently in earlier tables is repeated here.

It should be noted that the results reported in these five tables involving the *select laboratory groups* may be regarded as a special analysis of the results reported earlier. The reason for this, of course, is that the *select laboratory groups* at Levels II, III, and IV are really subgroups of the laboratory groups at these same levels previously reported upon. However, all the results previously reported at Level I remain unqualified by this further analysis because at Level I the two kinds of laboratory groups would be the same.

Table XIV compares the reading achievement scores of the *select laboratory group* and the no-laboratory group at Levels II, III, and IV. The only significant difference reported here shows up at Level III where the no-laboratory group is seen to achieve significantly better than the *select laboratory group.*

Table XV, reporting listening comprehension scores at Levels II,

III, and IV, shows that the no-laboratory group achieves significantly better than the *select laboratory group* at Levels III and IV.

Tables XVI, XVII, and XVIII report the proportions of the speech production responses of the *select laboratory* and no-laboratory groups at Levels II, III, and IV. While the differences in proportions within the highest quality category (category 3) favor the no-laboratory group on Levels III and IV, none of the differences reported in these three tables attains statistical significance.

VII. Select Laboratory Group Versus No-Laboratory Group at High and Low Expenditure Levels

As has been indicated above (Chapter III), an additional control was employed. The data were subjected to further analysis in relation to the net current expenditure of participating school districts.

Tables XIX, XX, and XXI compare the test results obtained with *select laboratory* and no-laboratory students for reading and listening comprehension at Levels I and II. Similar comparisons at higher levels and for speech production are not reported because too few students were available for such comparisons. The comparisons in all three of these tables show the scores of no-laboratory students exceeding those of laboratory students and, in all cases but one, the scores of students in higher expenditure schools exceeding the scores of those in the lower expenditure schools.

Table XIX contrasts the scores in reading comprehension between the laboratory and no-laboratory students at Level I. It is apparent that in high expenditure schools the reading comprehension scores of laboratory students fall 36 per cent behind the reading comprehension scores of no-laboratory students. In low expenditure schools, on the other hand, laboratory students trail no-laboratory students by 11 per cent.

Two striking features present themselves in comparing Table XX and Table XXI, both of which refer to Level II. First, it is seen that in high expenditure schools the performance of laboratory students relative to no-laboratory students is about the same for reading comprehension and listening comprehension. In both cases laboratory students' scores fall about 13 per cent below those

of the no-laboratory group. However, as Table XXI shows, in low expenditure schools the listening comprehension scores of laboratory students trail those of no-laboratory students by only 4.3 per cent. When the same kind of comparison is made with reading comprehension scores at Level II, as presented in Table XX, the laboratory students fall 18 per cent below the no-laboratory students.

These findings might be interpreted as indicating that in instructional situations in which less able teachers are presumed to be concentrated (lower expenditure schools), the use of language laboratories would not operate to the serious disadvantage of the students in the listening comprehension skill. For, in the absence of the laboratory, the student would not have available to him a source of superior instruction in this skill area. It would indeed seem reasonable to expect that one of the greatest differences between superior and inferior foreign language teachers would be in the area of competency with the foreign language as a spoken tongue. On the other hand, the converse relationship might be expected in high expenditure schools. In these schools it might be presumed that superior teachers would be concentrated because of relatively high salaries. It would be consistent with the general findings of the present investigation to speculate that in high expenditure schools the greater retardation of laboratory students relative to no-laboratory students in the listening skill arises because, in the absence of the language laboratory, the student has available to him, in the person of the superior teacher, a superior learning opportunity.

Chapter V

Concluding Observations and Summary

I. Concluding Observations

No attempt was made in the present study to indicate what results would be obtained under some ideal and highly creative program of language instruction into which the laboratory had been integrated according to organizational principles not yet widely accepted. Quite to the contrary, this study has attempted to assay the results that were obtained with the laboratory as it was actually being used.

On the basis of their subjective appraisal, most districts using the laboratory indicated that pupils experienced a decided improvement in motivation, fidelity of pronunciation, and speed of learning. More than half of the districts responding to a questionnaire judged that the results thus far obtained with the laboratory seemed to justify expanding the laboratory facilities. Some districts reported that it was still "too early" to make such a determination, but no respondent district stated flatly that the results obtained thus far with the laboratory failed to justify expansion.

Although mechanical failures were reported, in almost all cases respondent districts indicated their general satisfaction with the technical performance of the laboratory equipment. Almost all districts reported that both commercial and teacher-produced programming materials were used.

Most districts reported that students spent only one classroom period per week in the laboratory. Only one district stated that the time a student spent in the laboratory contributed to an actual increase in the total regularly scheduled class time spent with the target language. In all other cases, the time regularly spent in the laboratory merely replaced regularly scheduled class time that had been spent with the target language prior to the installation of the laboratory.

Absolutely no provision was made for central control of any kind over the independent language instruction programs going on in the various local school districts. Therefore, even the limited amount of information about these programs obtained by surveying the local districts must be considered merely suggestive of the use to which the laboratory was put during the period of the study. Not only the validity but also the reliability of this information might be questioned. Thus, not only may there have been errors in such cases, for example, where the respondent reported upon matters about which he did not have first-hand knowledge, but even where accurate information was obtained, there was little guarantee that the information reported would not be out-of-date very shortly thereafter. Indeed, this latter situation would have to be expected as the inevitable outcome of improvisation with the laboratory by relatively inexperienced teachers.

For such compelling reasons as these, very little attempt has been made in this study to interpret the results obtained in terms of specific features of the instructional program. Future studies may seek to identify and describe relationships between specific features of programs using the laboratory and specific instructional outcomes. This study was not designed to identify such relationships. The design of the study provided only for a comparison of instructional outcomes in three important skill areas between situations in which the laboratory was used and situations in which the laboratory was not used.

Nevertheless, without exaggerating in any way the reliability and validity of the information describing the implementation of the laboratory reported by local districts, it would seem fairly clear that in few cases, if any, was the introduction of the laboratory accompanied by the emergence of any new principles of organization for

instruction. Only one district, for example, adopted a plan for using the laboratory in such a way that time regularly spent in the laboratory would not merely replace regularly scheduled class time spent with the target language.

II. Summary

More than five thousand students of French in twenty-one school districts of the Metropolitan School Study Council were tested in three language skills: reading comprehension, listening comprehension, and speech production. The total number of students was distributed among two groups, a language laboratory group and a no-laboratory group at each of four levels of experience, that is, years of French instruction. In only one instance, that of speech production scores at Level I, was there found a significant difference that favored the language laboratory group. Significant differences that favored the no-laboratory group predominated and appeared in connection with each language skill tested. When comparisons were made using students within the same I.Q. band, or class, significant differences favoring the no-laboratory group of students were found almost exclusively with students at the upper end of the I.Q. distribution. Thus, at least in this study, high I.Q. students were found to be the most severely disadvantaged by the inclusion of the laboratory in the instructional program. Students of average I.Q. were found, within the limits of the measures and comparisons made in this study, to be relatively unaffected by the inclusion of the laboratory in the instructional program.

While this study does not purport to demonstrate that the language laboratory cannot be used effectively, it does show that in schools of the Metropolitan School Study Council, a group of schools characterized by competent and well-prepared teachers, better results in certain important skills areas are being achieved in instructional situations which do not use the language laboratory.

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Appendix A
Tables
(RAW SCORES)

TABLE I

READING COMPREHENSION MEAN SCORES BY GROUP AND LEVEL

	LEVEL I			LEVEL II			LEVEL III			LEVEL IV		
	M	N	σ	M	N	σ	M	N	σ	M	N	σ
Lab	12.82	1577	10.03	23.76	995	8.51	24.41	421	4.76	30.74	135	7.16
No-Lab	14.65	663	8.94	25.89	786	9.04	27.62	412	8.33	32.45	141	7.60
D_m	1.83*			2.13*			3.21*			1.71		
σD_m	0.43			0.42			0.47			0.89		
t	4.27			5.06			6.82			1.93		
M_l/M_{nl}	0.88			0.92			0.88			0.95		

*significant at .001 level

TABLE II

LISTENING COMPREHENSION MEAN SCORES BY GROUP AND LEVEL

	LEVEL II			LEVEL III			LEVEL IV		
	M	N	σ	M	N	σ	M	N	σ
Lab	22.89	849	6.19	28.40	322	5.67	33.48	114	4.54
No-Lab	23.62	781	7.41	31.92	403	6.28	35.95	139	4.29
D_m	0.73*			3.52**			2.47**		
σD_m	0.34			0.45			0.56		
t	2.15			7.91			4.42		
M_l/M_{nl}	0.97			0.89			0.93		

*significant at .05 level
**significant at .001 level

TABLE III

READING COMPREHENSION MEAN SCORES BY GROUP AND I.Q. CLASS AT LEVEL I

	CLASS 1			CLASS 2			CLASS 3			CLASS 4		
	M	N	σ	M	N	σ	M	N	σ	M	N	σ
Lab	18.48	505	9.37	12.20	302	7.85	9.47	317	7.11	7.33	9	7.67
No-Lab	20.25	224	7.94	14.93	172	6.97	10.65	205	7.97	4.89	9	4.51
D_m	1.77*			2.73**			1.18			2.44		
σD_m	0.68			0.70			0.69			2.97		
t	2.62			3.92			1.72			0.82		
M_l/M_{nl}	0.91			0.82			0.89			1.50		

*significant at .01 level
**significant at .001 level

TABLE IV

READING COMPREHENSION MEAN SCORES BY GROUP AND I.Q. CLASS AT LEVEL II

	CLASS 1			CLASS 2			CLASS 3			CLASS 4		
	M	N	σ	M	N	σ	M	N	σ	M	N	σ
Lab	25.85	355	11.02	23.91	138	8.45	19.92	126	8.30	13.33	3	6.12
No-Lab	29.61	389	7.51	23.35	200	8.80	20.30	181	8.52	18.83	6	12.86
D_m	3.76*			0.56			0.38			5.50		
σD_m	0.78			0.95			0.97			6.33		
t	4.80			0.59			0.39			0.87		
M_l/M_{nl}	0.87			1.02			0.98			0.71		

*significant at .001 level

TABLE V

READING COMPREHENSION MEAN SCORES BY GROUP AND I.Q. CLASS AT LEVEL III

	Class 1			Class 2			Class 3		
	M	N	σ	M	N	σ	M	N	σ
Lab	24.43	220	8.58	20.31	59	8.43	17.56	27	7.16
No-Lab	28.95	263	8.69	24.88	52	7.60	23.94	35	7.73
D_m	4.52**			4.57*			6.38*		
σD_m	0.79			1.50			1.90		
t	5.73			3.00			3.36		
M_l/M_{nl}	0.84			0.82			0.73		

*significant at .01 level
**significant at .001 level

TABLE VI

READING COMPREHENSION MEAN SCORES BY GROUP AND I.Q. CLASS AT LEVEL IV

	Class 1			Class 2			Class 3		
	M	N	σ	M	N	σ	M	N	σ
Lab	29.63	72	11.13	25.43	7	4.69	31.00	5	5.97
No-Lab	33.14	80	7.10	27.79	19	6.88	26.43	7	9.47
D_m	3.51*			2.36			4.57		
σD_m	1.53			2.37			4.47		
t	2.29			0.995			1.02		
M_l/M_{nl}	0.89			0.92			1.17		

*significant at .05 level

TABLE VII

LISTENING COMPREHENSION MEAN SCORES BY GROUP AND I.Q. CLASS AT LEVEL II

	CLASS 1			CLASS 2			CLASS 3		
	M	N	σ	M	N	σ	M	N	σ
Lab	24.70	305	7.27	22.90	126	6.31	20.04	122	5.57
No-Lab	26.31	386	6.97	21.86	197	5.74	20.06	176	6.15
D_m	1.61*			1.04			0.02		
σD_m	0.55			0.70			0.69		
t	2.94			1.50			0.03		
M_l/M_{nl}	0.94			1.05			0.999		

*significant at .01 level

TABLE VIII

LISTENING COMPREHENSION MEAN SCORES BY GROUP AND I.Q. CLASS AT LEVEL III

	CLASS 1			CLASS 2			CLASS 3		
	M	N	σ	M	N	σ	M	N	σ
Lab	29.57	172	5.35	28.00	48	5.86	24.88	26	5.16
No-Lab	32.42	256	6.32	29.67	54	7.52	27.76	33	6.10
D_m	2.85*			1.67			2.88		
σD_m	0.57			1.33			1.47		
t	5.03			1.26			1.96		
M_l/M_{nl}	0.91			0.94			0.90		

*significant at .001 level

TABLE IX

LISTENING COMPREHENSION MEAN SCORES BY GROUP AND I.Q. CLASS AT LEVEL IV

	Class 1			Class 2			Class 3		
	M	N	σ	M	N	σ	M	N	σ
Lab	34.58	60	4.57	34.71	7	4.92	32.00	6	3.22
No-Lab	36.19	79	4.35	33.32	19	4.09	33.29	7	4.65
D_m	1.61*			1.39			1.29		
σD_m	0.77			2.08			2.20		
t	2.10			0.67			0.59		
M_l/M_{nl}	0.96			1.04			0.96		

*significant at .05 level

TABLE X

DIFFERENCES BETWEEN THE PROPORTIONS OF ALL SPEECH PRODUCTION RESPONSES BY LABORATORY AND NO-LABORATORY GROUPS ASSIGNED TO EACH RESPONSE CATEGORY AT LEVEL I

	Lab	No-Lab	D_p	t
NR	.148	.192	.044*	3.39
1	.086	.125	.039*	3.55
2	.359	.372	.013	0.77
3	.407	.311	.096*	5.65

*significant at .001 level

TABLE XI

DIFFERENCES BETWEEN THE PROPORTIONS OF ALL SPEECH PRODUCTION RESPONSES BY LABORATORY AND NO-LABORATORY GROUPS ASSIGNED TO EACH RESPONSE CATEGORY AT LEVEL II

	Lab	No-Lab	D_p	t
NR	.132	.098	.034*	2.62
1	.062	.074	.012	1.20
2	.347	.379	.032	1.69
3	.459	.449	.010	0.50

*significant at .01 level

TABLE XII

DIFFERENCES BETWEEN THE PROPORTIONS OF ALL SPEECH PRODUCTION RESPONSES BY LABORATORY AND NO-LABORATORY GROUPS ASSIGNED TO EACH RESPONSE CATEGORY AT LEVEL III

	Lab	No-Lab	D_p	t
NR	.087	.067	.020	1.82
1	.058	.044	.014	1.56
2	.372	.354	.018	0.95
3	.483	.536	.053*	2.65

*significant at .01 level

TABLE XIII

DIFFERENCES BETWEEN THE PROPORTIONS OF ALL SPEECH PRODUCTION RESPONSES BY LABORATORY AND NO-LABORATORY GROUPS ASSIGNED TO EACH RESPONSE CATEGORY AT LEVEL IV

	Lab	No-Lab	D_p	t
NR	.063	.047	.016	1.60
1	.037	.025	.012	1.50
2	.333	.312	.021	1.05
3	.567	.616	.049*	2.33

*significant at .02 level

TABLE XIV

READING COMPREHENSION MEAN SCORES FOR SELECT LABORATORY AND NO-LABORATORY GROUPS AT LEVELS II, III, AND IV

	LEVEL II			LEVEL III			LEVEL IV#		
	M	N	σ	M	N	σ	M	N	σ
Select Lab	24.95	522	8.33	25.04	85	8.80	32.50	44	6.97
No-Lab	25.89	786	9.04	27.62	412	8.33	32.45	141	7.60
D_m	0.94			2.58*			0.07		
σD_m	0.49			1.04			1.23		
t	1.93			2.48			0.06		
M_{sl}/M_{nl}	0.96			0.91			1.002		

#*Note:* 3 years of laboratory experience on Level IV
*significant at .05 level

TABLE XV

LISTENING COMPREHENSION MEAN SCORES FOR SELECT LABORATORY AND NO-LABORATORY GROUPS AT LEVELS II, III, AND IV

	LEVEL II			LEVEL III			LEVEL IV#		
	M	N	σ	M	N	σ	M	N	σ
Select Lab	23.60	447	6.30	28.88	57	4.50	33.41	37	4.88
No-Lab	23.62	781	7.41	31.92	403	6.28	35.95	139	4.29
D_m	0.02			3.04*			2.54**		
σD_m	0.40			0.67			0.88		
t	0.05			4.52			2.88		
M_{sl}/M_{nl}	0.999			0.90			0.93		

#*Note:* 3 years of laboratory experience on Level IV
*significant at .001 level
**significant at .05 level

TABLE XVI

DIFFERENCES BETWEEN THE PROPORTIONS OF ALL SPEECH PRODUCTION RESPONSES BY SELECT LABORATORY AND NO-LABORATORY GROUPS ASSIGNED TO EACH RESPONSE CATEGORY AT LEVEL II

	Select Lab	No-Lab	D_p
NR	.115	.098	.017
1	.072	.074	.022
2	.333	.379	.046
3	.481	.449	.032

TABLE XVII

DIFFERENCES BETWEEN THE PROPORTIONS OF ALL SPEECH PRODUCTION RESPONSES BY SELECT LABORATORY AND NO-LABORATORY GROUPS ASSIGNED TO EACH RESPONSE CATEGORY AT LEVEL III

	Select Lab	No-Lab	D_p
NR	.098	.067	.031
1	.060	.044	.016
2	.370	.354	.016
3	.473	.536	.063

TABLE XVIII

DIFFERENCES BETWEEN THE PROPORTIONS OF ALL SPEECH PRODUCTION RESPONSES BY SELECT LABORATORY AND NO-LABORATORY GROUPS ASSIGNED TO EACH RESPONSE CATEGORY AT LEVEL IV

	Select Lab	No-Lab	D_p
NR	.061	.047	.014
1	.039	.025	.014
2	.352	.312	.040
3	.548	.616	.068

TABLE XIX

READING COMPREHENSION MEAN SCORES FOR LABORATORY AND NO-LABORATORY STUDENTS WITHIN HIGH EXPENDITURE AND LOW EXPENDITURE SCHOOLS AT LEVEL I

	Lab	No-Lab	M_l/M_{nl}
High Expenditure	13.06	20.56	0.64
Low Expenditure	13.34	15.00	0.89

TABLE XX

READING COMPREHENSION MEAN SCORES FOR SELECT LABORATORY AND NO-LABORATORY STUDENTS WITHIN HIGH EXPENDITURE AND LOW EXPENDITURE SCHOOLS AT LEVEL II

	Select Lab	No-Lab	M_{sl}/M_{nl}
High Expenditure	27.72	31.84	0.87
Low Expenditure	19.50	23.80	0.82

TABLE XXI

LISTENING COMPREHENSION MEAN SCORES FOR SELECT LABORATORY AND NO-LABORATORY STUDENTS WITHIN HIGH EXPENDITURE AND LOW EXPENDITURE SCHOOLS AT LEVEL II

	Select Lab	No-Lab	M_{sl}/M_{nl}
High Expenditure	25.63	29.53	0.87
Low Expenditure	19.77	20.65	0.96

Appendix B

A Note on the Metropolitan School Study Council French Speech Production Test

PART ONE

For each test item the student was required to pronounce the French word indicated:

I. tête
II. train
III. livre
IV. plume
V. pain
VI. dent
VII. poisson
VIII. un
IX. église
X. manteau

PART TWO

For each test item the student was required to read aloud the sentence in French indicated:

XI. Ta carte est là.
XII. Ton père arrive.
XIII. Il y a deux garçons
XIV. Tu es dans la rue.
XV. Donnez-moi la main.
XVI. Il demande un crayon.
XVII. Nous trouvons un ballon.
XVIII. Le président habite la capitale.
XIX. Il y a des cafés dans cette rue.
XX. Il faut un peu d'eau.